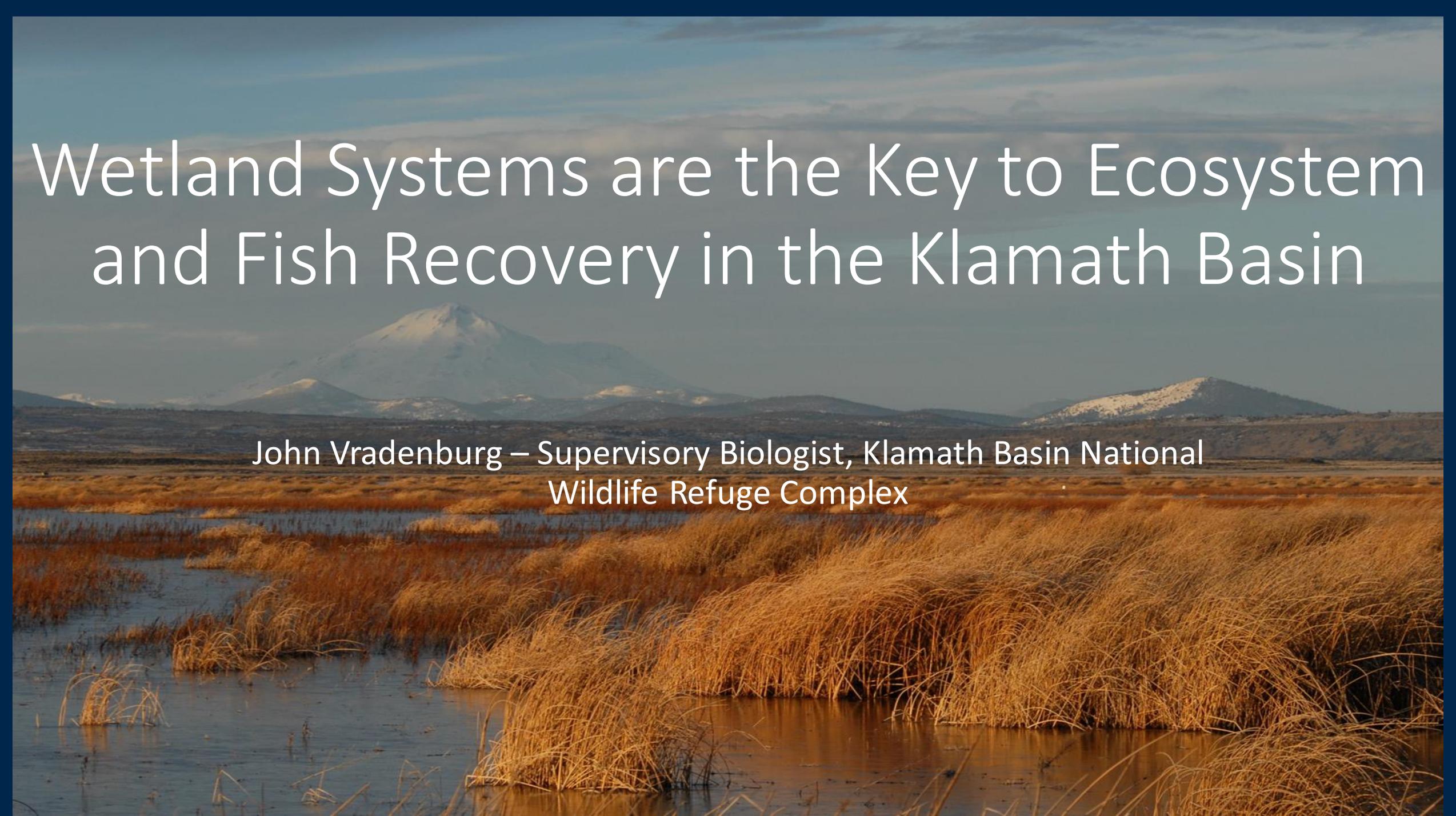


# Wetland Systems are the Key to Ecosystem and Fish Recovery in the Klamath Basin

John Vradenburg – Supervisory Biologist, Klamath Basin National  
Wildlife Refuge Complex



# Ecological Resilience

- “The amount of disturbance that an ecosystem can withstand without changing self-organized processes and structures”
- “The return time to a stable state following a perturbation.”

More Simply – Ecologically resilient systems can take significant disturbance without collapsing.

Historically the Klamath Basin was ecologically resilient because of wetland systems

Whereas

The modern Klamath Basin is not due to the loss of those wetland systems

# Ecological resilience exists at multiple temporal and spatial scales

- Historically the resilience of the Klamath Basin was driven by the presence of large wetland basins and their associated organic soils

AND

- Traditionally we relied on the resilience of the Klamath Basin to:
  - Support migratory networks of fish and waterbirds
  - To support agriculture because of the wetland's ability to continue to produce nutrient rich soils
  - To store and transmit water
  - To use that same water to support basic life services (i.e., drinking water) of humans.
  - The connections among groundwater, surface water, and wetlands promoted the filtering of nutrients in that system.
  - Wetlands buffered us during drought, increasing human resiliency (and fish/wildlife) to drought as they stored vast amounts of water.

# The Upper Klamath Basin 1905

Over 300,000 Acres Semi- Permanent and  
Permanent Wetland

Over 140,000 Acres of seasonal wetlands primarily  
wet meadow and riparian wetlands

**The abundance of water and  
wetlands defined this landscape  
It was a WET place!**



# Historical Wetland System of the Pre-Altered Upper Klamath Basin

Lost River System  
"Closed Basin"

Klamath River System  
"Open"

Sycan Marsh



Clear Lake



Klamath Marsh



Upper Klamath Lake



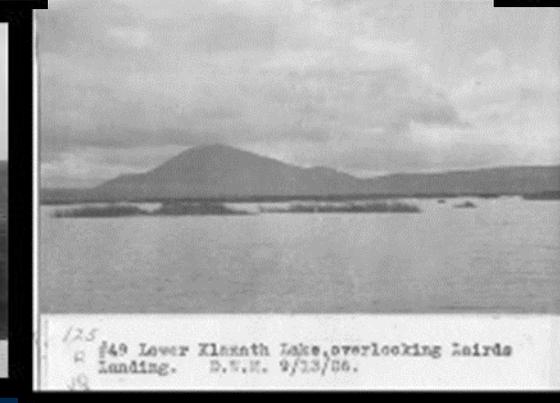
Lost River  
(Langell and  
Poe Valley)



Klamath River



Lower Klamath Wetlands

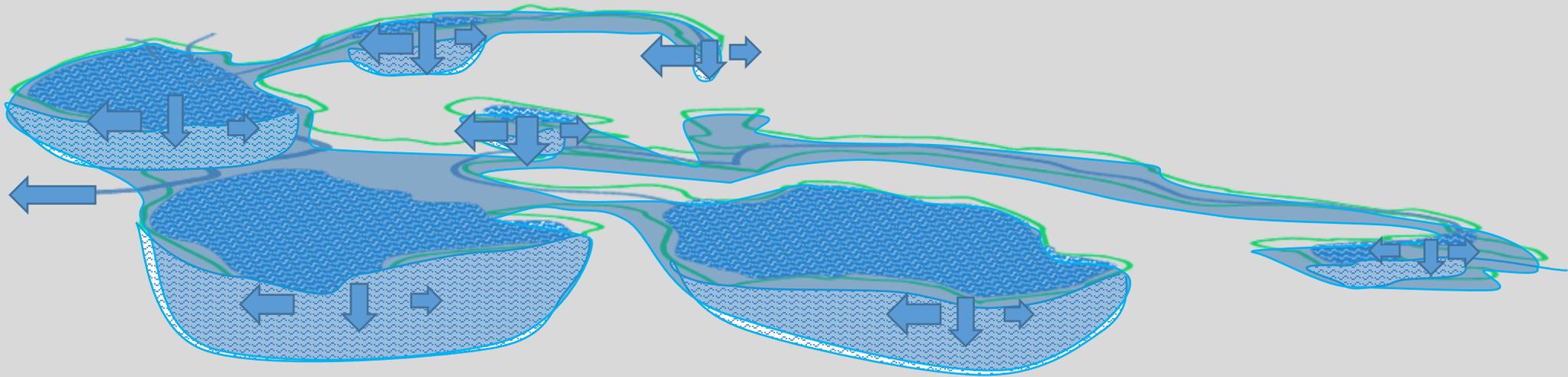


Lower Klamath Lake



Tule Lake

# Hydrologic Processes of Wetland System in the Pre-Altered Klamath Basin



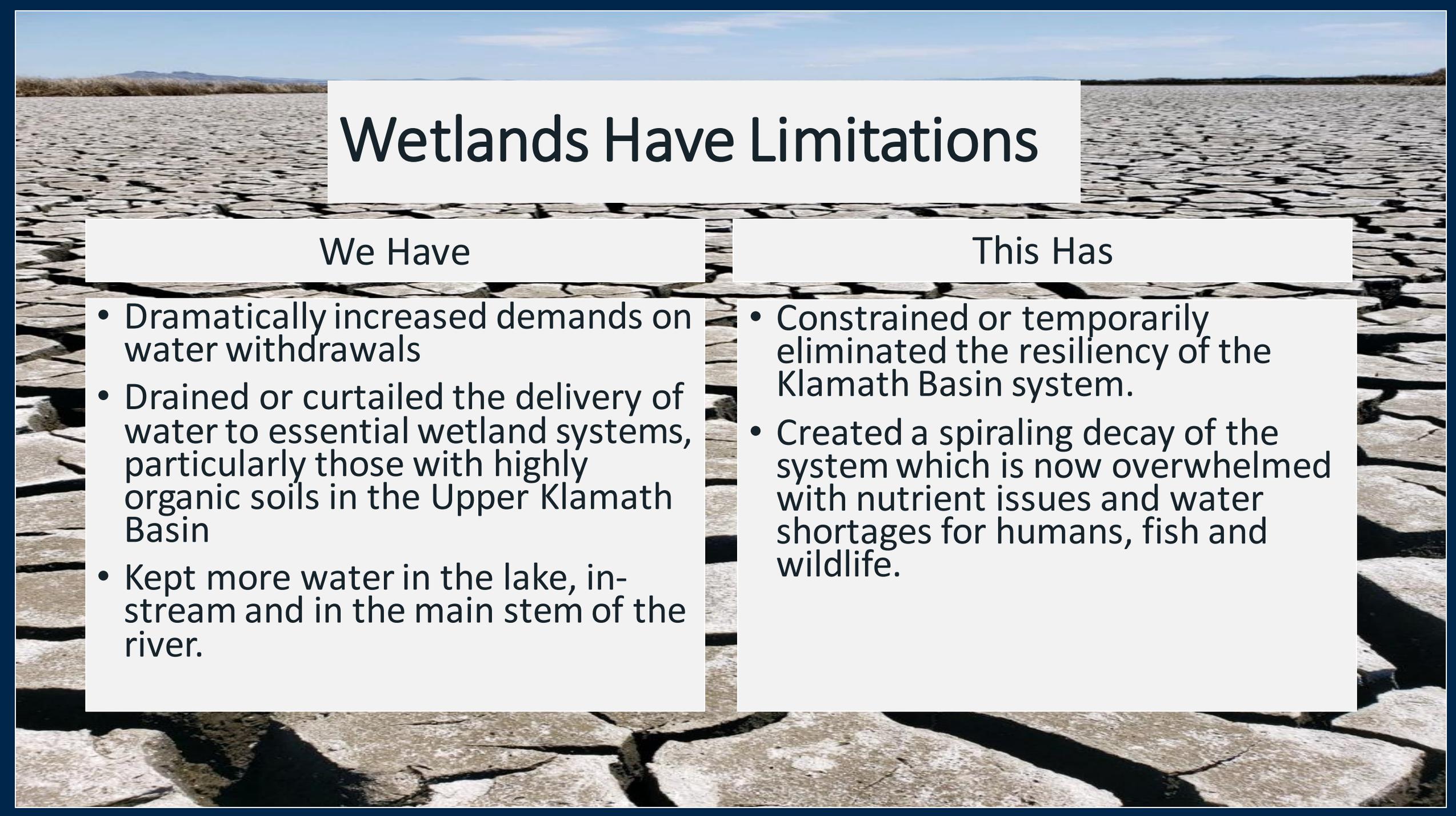
The natural functioning wetland systems could:

- Capture and absorb flood water
- Store water
- Attenuate stream and river flows through a slow release of captured water
- The size of these wetlands basins could persist through prolonged dry periods

=

Ecological Resiliency

- Wetland Systems of the Upper Klamath Basin are the hydrological and ecological lynchpin for:
  - Species persistence and survival
  - Reliability and function of the Klamath watersheds hydrology
  - The enhancement and maintenance of water quality and supply throughout the Klamath Basin
- However wetland systems are not integrated into the recovery of the Klamath Basin ecosystem or the species that evolved under the historical wetland conditions and processes.
- Looking forward to a dams out future we have to recognize the role wetland systems played in the hydrology, habitat, and life cycle requirements of species that evolved in a system dominated by wetlands and recognize we can emulate this in this highly modified system.



# Wetlands Have Limitations

## We Have

- Dramatically increased demands on water withdrawals
- Drained or curtailed the delivery of water to essential wetland systems, particularly those with highly organic soils in the Upper Klamath Basin
- Kept more water in the lake, in-stream and in the main stem of the river.

## This Has

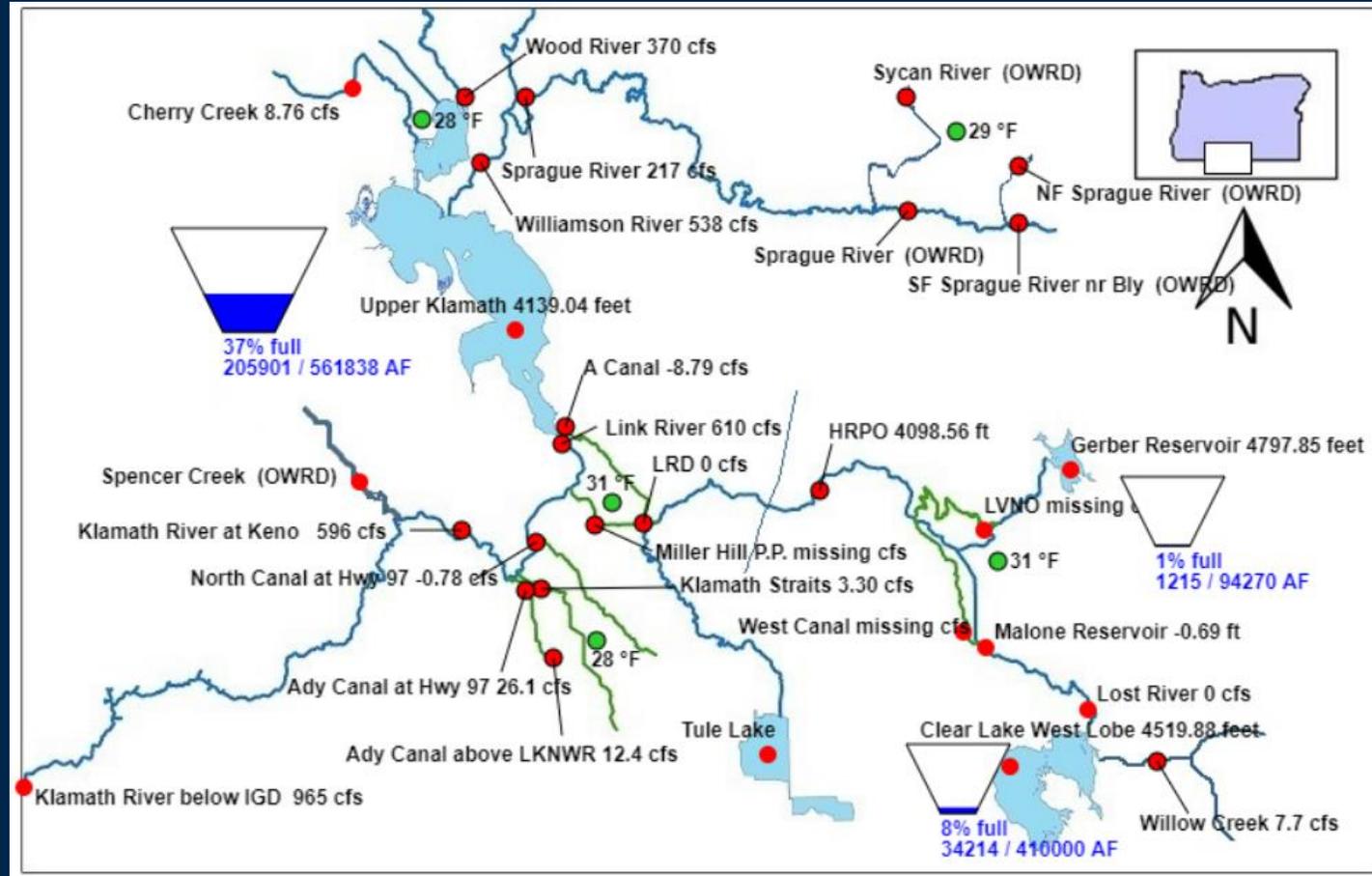
- Constrained or temporarily eliminated the resiliency of the Klamath Basin system.
- Created a spiraling decay of the system which is now overwhelmed with nutrient issues and water shortages for humans, fish and wildlife.

# The Klamath Basin of Today

- The ability of the system to provide resiliency in drought has been decimated.
- The vast majority of wetland habitat are now agricultural wetlands whose value for food production and energetic resources are important. However, their ability to store and transmit water are a fraction of what the historical wetland system could provide.
- The resources provided to fish and waterbirds are insufficient to support the diversity and abundance of the system present in the Klamath Basin even 20 years ago.

# Modern Klamath Basin Hydrology

- Water is now managed as a put and take system, however the pressure exceeds the natural system's ability to provide water resources
- This is leading to further and further system decay.
- This decay impacts natural resources and people in both the Upper Basin and the Lower Basin



# We Need a Paradigm Shift

- This is not a fish, a waterbird, a water availability, water quality or environmental policy issue
- The issues of the Klamath Basin are related to system decay.
- We must recognize that every aspect of the system is being impacted.
- We cannot continue to focus on individual symptoms
- Our focus has to be on restoring the integrated system.



Freshwaters-Openwaters, Wetlands and Floodplains. - Scientific Figure on ResearchGate. Available from: [https://www.researchgate.net/figure/Links-between-landscape-location-and-wetland-services-Labels-in-orange-are-indicative-of\\_fig1\\_232815731](https://www.researchgate.net/figure/Links-between-landscape-location-and-wetland-services-Labels-in-orange-are-indicative-of_fig1_232815731) [accessed 7 Dec, 2022]

If the drought tells us nothing else, it is telling us that the Klamath Basin we are living and working in today is not ecologically resilient.

# Looking Forward

- We have modified the hydrology of the Klamath Basin at the expense of wetland systems, particularly those on public land
- The drought tells us that this new ecological state is not resilient and it is failing to provide the benefits that the historic system provided.
- As we see a dams out future we must recognize the species and conditions we are trying to recover evolved with the habitat, instream conditions, connectivity, and hydrology driven by the hydrologic and ecological benefits and services wetland systems of the Upper Klamath Basin supported

# Summary

- The significance of the role wetland systems played in the historical Klamath Basin is clear
- The loss of ecological resiliency across the Klamath Basin is directly linked to the loss and degradation of wetland systems
- The recovery of fish and wildlife, water supplies, and water quality hinges on restoring ecological resiliency throughout the Klamath Watershed
- If we do not restore ecological resiliency we will continue to have these types of meetings well into the future, each one will focus on a further degraded system, continued decline of species and what do with an ever shrinking water supply.

# The Math is Simple



A Klamath Basin with functioning wetlands systems = A wet Klamath Basin

A wet Klamath Basin = An ecologically resilient Klamath Basin

An Ecologically Resilient Klamath Basin = A Klamath Basin that can drive the recovery of fish, wildlife, water and our communities

A vast landscape filled with a massive flock of birds, likely shorebirds, in flight. The birds are scattered across a clear blue sky, a wide expanse of golden-brown marsh grasses, and a body of water in the foreground. The water is a deep blue, and several clumps of tall, dry grasses emerge from it. In the far distance, a range of mountains is visible under the bright sky. The overall scene is one of natural abundance and movement.

Thank You for Your Time and Interest